Claims:

1. A transconductance circuit for receiving an input signal and performing voltage-to-current conversion, comprising:

a differential amplifier having a first input terminal and a second input terminal for receiving an input voltage signal and providing a load voltage signal;

a load for converting the load voltage signal into an intermediate current signal, the load having a first terminal and a second terminal, wherein the first terminal is connected to a first output terminal of the differential amplifier and the second terminal connected to a second output terminal of the differential amplifier;

an amplifying stage coupled to the load for amplifying the intermediate current signal and having an output port for providing an output current signal;

a current feedback element for maintaining constant potential differences between the first input terminal and the first output terminal and across the second input terminal and the second output terminal of the differential amplifier, the feedback element being coupled to the differential amplifier and the amplifying stage.

2. The transconductance circuit of claim 1, wherein the current feedback element comprises a first voltage follower and a second voltage follower.

3. The transconductance circuit of claim 2, wherein each of the first voltage follower and the second voltage follower comprises a cascaded emitter follower.

4. The transconductance circuit of claim 3, wherein each of the first voltage follower and the second voltage follower comprises a first transistor and a second transistor, the emitter of the first transistor being connected to the base of the second transistor.

5. The transconductance circuit of claim 1, wherein the differential amplifier comprises two transistors.

6. The transconductance circuit of claim 5, wherein the base of one of the two transistors is connected to the first input terminal and the base of the other of the two transistors is connected to the second input terminal.

7. The transconductance circuit of claim 6, wherein the collector of one of the two transistor is connected to the base of the first transistor of the first voltage follower and the collector of the other of the two transistors is connected to the base of the first transistor of the second voltage follower.

8. The transconductance circuit of claim 1, wherein the differential amplifier is biased by biasing means, the biasing means comprising a first current mirror.

9. The transconductance circuit of claim 8, wherein the first current mirror comprises at least three transistors.

10. The transconductance circuit of claim 9, wherein the first current mirror comprises a first and a second transistor, the drain of the first transistor being connected to the collector of one of the two transistors of the differential amplifier and the base of the first transistor of the first voltage follower, the drain of the second transistor being connected to the collector of the other of the two transistors of the differential amplifier and the base of the first transistor of the second voltage follower.

11. The transconductance circuit of claim 1, wherein the output port of the amplifier stage is coupled to a sub-harmonic stage.

12. The transconductance circuit of claim 1, wherein the amplifying stage comprises a second current mirror.

13. The transconductance circuit of claim 12, wherein the second current mirror comprises two pairs of transistors, the bases of each pair of transistors being interconnected.

14. The transconductance circuit of claim 13, wherein the interconnected bases of one of the two pairs of transistors are further connected to the emitter of the second transistor of the first voltage follower and the interconnected bases of the other of the two pairs of transistors are further connected to the emitter of the second transistor of the second voltage follower.

15. The transconductance circuit of claim 1, wherein the first input terminal and the second input terminal are coupled to a voltage divider.

16. The transconductance circuit of claim 1, wherein the load is a passive device.

17. The transconductance circuit of claim 16, wherein the passive device is a resistor.

18. A method for performing voltage-to-current conversion, comprising the steps of:

applying an input voltage signal to a differential amplifier, the differential amplifier having a first input terminal, a second input terminal, a first output terminal and a second output terminal;

providing a load voltage signal across the first output terminal and the second output terminal;

maintaining constant potential differences between the first input terminal and the first output terminal and across the second input terminal and the second output terminal of the differential amplifier through a current feedback element;

converting the load voltage signal into an intermediate current signal by applying the load voltage signal across a load.

19. The method of claim 18, further comprising the step of amplifying the intermediate current signal using an amplifying stage for producing the output current signal.

20. The method of claim 19, further comprising the step of coupling the output current signal to a sub-harmonic stage.